

Spectral Analysis of the Matrix-Sequences Coming from the Discretization of Semi-Elliptic Differential Equations

D. Noutsos

DEPARTMENT OF MATHEMATICS, UNIVERSITY OF IOANNINA, GREECE

S. Serra Capizzano

DIPARTIMENTO DI FISICA E MATEMATICA, UNIVERSITÀ DELL'INSUBRIA - SEDE DI COMO,
ITALY

C. Tablino Possio

DIPARTIMENTO DI MATEMATICA E APPLICAZIONI, UNIVERSITÀ DI MILANO BICOCCA, ITALY

Paris Vassalos

pvassal@aub.gr, pvassal@uoi.gr

DEPARTMENT OF INFORMATICS, ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS,
GREECE

We are concerned with the study of spectral properties of matrices coming from discretization using centered finite differences, of elliptic (or semielliptic) differential operators $L(a, u)$ of the form

$$\begin{cases} -(a(x)u_x)_x = f(x) & \text{on } (0, 1), \\ \text{Dirichlet B.C. on } \partial\Omega, \end{cases}$$

where the nonnegative coefficient function $a(x)$ of the differential operator may have some isolated zeros in Ω . More precisely, we state and prove some relations between the orders of zeros of $a(x)$ and the asymptotic behavior of the minimal eigenvalue (condition number) of the related matrices. The results are generalized in the 2D case. As a conclusion, and in connection with our theoretical analysis, we present various numerical experiments.